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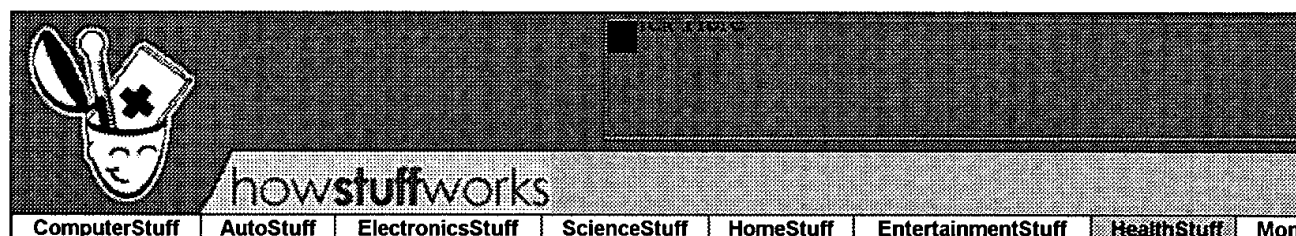
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How Congestive Heart Failure Works

by [Carl Bianco, M.D.](#)



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Medications

- **Diuretics** (water pills) are medications used to increase the amount of water excreted by the kidneys. This **reduces the blood volume and the** **that the** heart has to pump, thereby reducing its workload. The goal is to achieve an ideal weight by eliminating edema. Diuretics include:
 - hydrochlorothiazide
 - chlorothalidone
 - metolazone (Zaroxolyn)
 - furosemide (Lasix)
 - bumetanide (Bumex)
 - trimetazene
 - spironolactone

A major side effect is a low potassium (K+) level, which can cause irregular and abnormal heart rhythms. Potassium supplements or potassium-sparing diuretics can be used either alone or in combination with other diuretics.

- **Vasodilators** are groups of medications that dilate or enlarge blood vessels. In CHF, the blood vessels are often constricted due to the activation of the sympathetic nervous system and the renin-angiotensin-aldosterone system. When vasodilators are used, they decrease the resistance and blood pressure against which the heart must beat, thus increasing the cardiac output. Angiotensin-converting enzyme inhibitors (ACE inhibitors) are very effective vasodilators. This is one of the medications that have actually been shown to prolong life in CHF patients. ACE inhibitors reduce blood pressure and fluid retention by preventing the renin-angiotensin-aldosterone system from working. ACE inhibitors

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captopril (Capoten)
 enalapril (Vasotec)
 lisinopril (Zestril, Prinivil)
 benazepril (Lotensin)
 fosinopril (Monopril)
 quinapril (Accupril)

Side effects include cough and occasionally a rash.

Angiotensin receptor blockers block the effects of angiotensin on its production. Angiotensin receptor blockers include:

losartan (Cozaar)
 irbesartan (Avapro)
 valsartan (Diovan)

These medications do not cause the side effect of cough produced by ACE inhibitors.

Nitroglycerin dilates veins and can be taken under the tongue (Nitro), intravenously, by mouth (Isosordil, Sorbitrate, ISMO), or by skin patch (Transderm-Nitro).

Calcium channel blockers dilate blood vessels and are sometimes used, especially when ischemia is present. These drugs also tend to decrease the heart's contraction, however, and so can worsen CHF. Calcium channel blockers include:

- nifedipine (Procardia XL, Adalat CC)
- diltiazem (Cardizem)
- verapamil (Calan, Isoptin)
- amlodipine (Norvasc)
- felodipine (Plendil)
- nisoldipine (Sular)

Side effects include low blood pressure, headache, edema, and constipation. • Hydralazine is a vasodilator that acts on arteries. It is used less frequently than ACE inhibitors have been found to be more effective.

- Alpha blockers block the alpha-adrenergic receptors of the sympathetic nervous system, thereby dilating blood vessels. Alpha blockers include prazosin (Minipress) and doxazosin (Cardura). Side effects include rapid heartbeat and low blood pressure.

Digitalis medications (digoxin, Lanoxin) increase the force of contraction of the heart muscle and also control abnormal heart rhythms, especially atrial fibrillation and atrial flutter. Therefore, digitalis is most useful when someone with atrial fibrillation or atrial flutter has CHF (a fairly common scenario). It improves heart function without increasing mortality. It has many side effects, including nausea, vomiting, many types of abnormal heart rhythms, confusion and neurotoxicity, and interactions with other medications.

- Beta blockers have been found to be useful for CHF. By blocking the beta-adrenergic receptors of the sympathetic nervous system, the heart's force of contraction is decreased. Of course, this must be done carefully, as decreasing these two things can actually worsen CHF. Beta blockers include:
 - metoprolol (Lopressor, Toprol-XL)
 - atenolol (Tenormin)
 - carvedilol (Coreg)

- Sympathomimetic medications act similarly to the sympathetic nervous system and are used when CHF is severe, such as in cardiogenic shock. They increase the force of the heart's contraction. Sympathomimetic drugs include dopamine (Inotropin) and dobutamine (Dobutrex). Because they must be given intravenously and are extremely strong, these medications are used only when CHF has become life threatening. They can cause abnormal heart rhythms and ischemia.

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